

24th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human Exploration of Mars (2)

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PROMINENCE, THE FUTURISTIC MARTIAN SURFACE VEHICLE

Abstract

The human dream to colonize Mars might be a reality soon. Colonization demands an effective and reliable transport solution. To enhance comfortable Martian surface travel, a novel vehicle design is proposed in this paper. The motivation for research on this idea is driven by the various difficulties a conventional rover design encounters while operating on the Martian surface. Prominence which means "importance", is the proposed vehicle design with a chassis developed with the combination of Aluminium alloy and Pyrogel.

Aluminium alloys are used in the exterior of the chassis due to their excellent pressure handling capability, material reliability, structural stability, and high strength to weight ratio whereas Pyrogel is used in the interior as it has excellent thermal insulation properties that help in maintaining the optimum temperature of the vehicle. Iterations of brainstorming led the team to the finalization of the vehicle's propulsion system considering various constraints such as efficiency, reliability & availability. One of the critical attributes of Mars is the Martian dust storm which usually occurs at least once in a Martian year.

An inexhaustible solar energy source will power the vehicle for its electrical and mechanical operations while a novel energy production system will harness the necessary mechanical and electrical energy during a Martian dust storm. A novel multi-functional radiation shielding system is proposed for shielding the rover.

The challenge was to provide the optimum human body functioning environment inside the rover. Life support systems provided inside the vehicle ensure optimum pressure and temperature. A combination of active and passive thermal controls is used. A novel air control system will provide the oxygen from the Martian atmosphere using Carbon dioxide. The communication and navigation system proposed for the rover will help passengers in navigating & communicating. Safety mechanisms for the passengers in the case of emergency are also discussed. Prominence aims to provide an ideal vehicle design that will help the future colony to travel on the Martian surface with ease. This small vision will help in the realization of the Mars colonization dream of mankind.